Tibial stent: Designing a novel fixation device for pediatric orthopaedic tibia fractures

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Create expandable implant for tibia fractures in children that aligns and supports the bone

**Requirements**

- Must avoid growth plates
- Must be biocompatible
- Must have sufficient stability
Tibial fractures constitute 5% of all fractures in children.

Current procedure utilizes elastic nails.

Difficult to implant and align.

$259-328 for titanium and $78 for stainless steel.
Design

- Vertical compression creates horizontal expansion

Flexible Wires  End Cap  Current Prototype

Mid Cap
Design Evaluation

Implantation Test

Resultant Force From Varying Axial Forces

SolidWorks Analysis
New Designs will include more wires
Loops of wire will be used at the end cap and distal cap to secure the device and facilitate removal
A handheld tensioning device will be used during implantation
Fabrication

- Components will be machined on a Micro mill
- All components grade 304 Stainless Steel
- Wires will be welded into sockets using 304 Stainless Steel electrodes
Future Testing

- Biomechanical Analysis in Animal Model
  - Rotational Stability
  - Axial Stress Durability
  - 4–point bending: Sagittal and Coronal Plane

http://grabcad.com/library/mts-machine

https://www.biomedtown.org/biomed镇/LHDL/Reception/collection/FourPointBendingOfLongBones
## Final Product

### Packaging
- Sterile
- Surgical Grade
- Individually wrapped (one time use)

### Cost
- 304 Stainless Steel Rod Stock 1/4 “ $0.50
- 304 Stainless Wire x 4 $4.00
- 304 Stainless Strand 1/16 “ $4.81
- Manufacturing $200.00
- TOTAL $209.31
# Timeline

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- Prof. Tracy Puccinelli
- Prof. Darryl Thelen
- Prof. Hiedi Ploeg

http://theweinblog.wordpress.com/2011/08/03/
References
